ARTHROSCOPY OF KNEE - A CLINICAL STUDY

THESIS SUBMITTED FOR THE DEGREE OF

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CERTIFICATE

This is to certify that all the observations for the thesis "ARTHROSCOPY OF KNEE - A CLINICAL STUDY" were carried out by the candidate, Dr. Z.A. Sami, under my guidance and his results have been regularly checked by me.

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C O N T E N T S

I N T R O D U C T I O N

INTRODUCTION

To operate or not to operate - this is a vexing question the clinician often faces. In the case of the knee joint, the dilemma is as acute as elsewhere and especially so when radiological investigations prove to be inconclusive.

"To inflict minimal trauma to gain maximum information" is a maxim arthroscopy comes close to achieving. Under direct vision the pathology can be scrutinized, biopsies taken, and the decision to operate (or not to operate) can be made with confidence. Complications are minimal and discomfort to the patient is non-existant.

However the role of the arthroscopist is fraught with pitfalls. Only too often the view through an arthroscope is obscured by a film of blood or infusion of the knee gets clogged. And to add to the heart breaks, repeated electricity failures can reduce the surgeon to tears! With increasing dexterity in the use of the arthroscope most of these draw backs can be gradually overcome to a large extent.

Arthroscopy is an art new to this country. Its potential is unlimited but its main draw-backs are the

cost of the arthroscope and interpretation of the findings. According to the literature it requires at least a hundred arthroscopies before diagnosis can be made with confidence. Hence with my meagre twenty cases I was repeatedly forced to fall back upon the clinical diagnosis and pathological findings and co-relate it to my arthroscopic results.

With the effectiveness of the arthroscope proved beyond doubt, I utter a hope that this new weapon in the arsenal of the Orthopaedic surgeon finds widespread use in the future.

HISTORICAL ASPECT

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The history of endoscopic examination of the human body extends to more than a century, when in 1877 Max Nitze invented his first cystoscope. Considering this long history one feels surprised that arthroscopy, at once a science and an art, is relatively a recent phenomenon.

Takagi pioneered the use of the arthroscope in 1918 when he examined the knee of a Cadaver using a No.22 (7.3 mm) Charrie're Cystoscope. The first arthroscope Takagi constructed was also 7.3 m.m. diameter - far too large for effective arthroscopy. However, Takagi persevered in his attempts to improve upon his arthroscope and one after another in quick succession he designed a series of arthroscopes which not only became slimmer, more versatile but also the last word in sophistication. His number I arthroscope, designed in 1931, was only 3.5 m.m. in diameter and though crude by mordern standards, was far in advance of its times.

Other workers also concentrated their efforts on arthroscopy and in this connection, a galaxy of names come to the mind. More prominent amongst these workers was Eugen Bircher who in 1921 examined the knee using a Jacobsons

laproscope. In 1931 Harry Finkelstein and Leo Mayer devised an arthroscope for punch biopsy. However all this work was done in the realm of research and it was solely the endeavours of Takagi which gave arthroscopy the dignity of a useful clinical tool.

In 1932 Takagi added a new dimension to arthroscopy - namely photography. The first photographs were black and white but in 1936 he switched to colour.

Takagi's No.12 arthroscope consisted of two telescopes, a flexible biopsy punch and a cauteriser along with other accessories. These instruments were introduced via the same sheath having an outside diameter of 4 m.m.

Takagi used his arthroscope as a pan endoscope and probed into other body cavities. He thus used it for examination of the spinal cord in cases of spina bifida and to observe the interior of a tuberculous abscess in the illiac fossa.

In 1959 Watanabe published his results using the No.1 Arthroscope. This paper put the seal of success on the arthroscope and ever since it has been used in all advanced centres as an aid to diagnosis.

REVIEW OF LITERATURE

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ROLE OF ARTHROSCOPY

After having read innumerable articles on the topic of Arthroscopy one is left in little doubt as regards the role of the Arthroscope in the diagnosis of the internal derangements of the knee. The popularity of this instrument is rapidly increasing and it will not be very surprising to see it become an instrument of common use even in India.

Kenneth B. De Havens and H. Roger Collins have analysed the role of Arthroscopy and come up with very convincing case for Arthroscopy as an aid to diagnosis. In a hundred random cases arthroscopy was found to be accurate in 94, influenced surgical therapy in 55 and revealed unexpected disease in 25. It was found to be critical for diagnosis in 16 patients. In another series 23 patients were analysed and unnecessary operation avoided in 21.

De Haven and Collins divided their series of hundred patients into three groups.

A. Correct clinical diagnosis, which was made in 72 patients. In 51 out of these cases there was complete

correlation between clinical diagnosis, arthrography, arthroscopy and arthrotomy. In 21 cases either arthrography or arthroscopy was incorrect.

B. Ten patients in whom the clinical diagnosis was correct but incomplete.

C. Eighteen patients in whom the clinical diagnosis proved to be incorrect.

In the first group of correct clinical diagnosis pathological lesions encountered were -

(i) Meniscal lesions	- 86 cases
(ii) Tear of anterior cruciate ligament	- 27 cases
(iii) Chondromalacia Patellae	- 19 cases
(iv) Chondral lesions of tibia and femur	- 20 cases
(v) Loose bodies	- 5 cases

(Multiple lesions were present in 46 cases).

In the second group of incomplete correct clinical diagnosis the usual pattern was a tear in both the menisci but clinically and arthrographically appearing as only medial meniscal tear. Arthroscopy revealed the lateral meniscal tear.

In the third group (18 cases), in 14 cases both clinical and arthrographic findings were in error but the correct

diagnosis was made on Arthroscopy. 4 of these patients had tears of lateral miniscus. In 3 of the 18 cases arthroscopy lead to incorrect diagnosis - these were (a) chondromalacia patellae, chondral fracture of patella, and tear of anterior cruciate ligament.

In yet another series of 23 patients De Haven and Collins performed arthroscopy but not arthrotomy. In all these patients clinical evidence showed a need for arthrotomy. These patients were followed up from 9 months to two years and only two cases had arthrotomy subsequently.

Accuracy of Arthrography (in contrast to arthroscopy)

Arthrography proved to be only 76% accurate (Arthroscopy has proved to be 94% accurate). For tears of medial miniscus it was 84% accurate with 10 false positives and 6 false negatives.

Some common Arthroscopic errors (encountered in 6 patients)

1. Partial tear of anterior cruciate ligament appeared to be a torn discoid lateral meniscus.

2. In 3 cases posterior peripheral tears of medial meniscus could not be visualised directly. Arthrograms were however positive in these cases.

3. Two cases, one with chondromalacia patellae and the other with chondral fracture of patella were missed.

De Haven and Collins stress in their article that the three procedures - arthrography, arthroscopy and arthrotomy should be used to complement one another. For instance the inferior surfaces and periphery of menisci may be inaccessable to the arthroscope but may be well visualised on arthrography. On the other hand the posterior compartment cannot be visualised on arthrotomy whereas it is possible to do so with arthroscopy.

The findings of Hamish Gillius and David Siligun appear to challenge De Haven and Collins. These workers have found arthroscopy to be least accurate whilst clinical evaluation was the most accurate. Arthrography holds a middle position. Most of the errors were associated with lesions of the posterior horn.

A correlation of arthroscopy with other diagnostic modalities:- Though the effectiveness of the arthroscope has been proved time and time again questions as regards to its usefulness is still being raised by many authorities. Hence it becomes imperative to correlate arthroscopy with other diagnostic modalities and present a fair picture of the arthroscope on the diagnostic scale.

Teng-Liang Huang and his associates carried out, between July 1975 and October 1977, 480 arthroscopies of the knee. Out of these 120 cases were such that warranted a surgical intervention. Arthrography was performed on such patients after which arthroscopy was carried out.

Techniques of arthrography - Double contrast arthrograms were obtained utilizing 5-10 cc. of Renografin dye with 20 cc. of air.

Technique of arthroscopy (mentioned in Material and Methods).

96 patients underwent arthrography followed by arthroscopy and arthrotomy. There was full positive correlation between the clinical diagnosis, arthrography, arthroscopy and arthrotomy in 59 out of 96 cases. Arthrography most frequently was incorrect and clinical assessment was accurate in 81 cases.

In 53 of 59 cases arthroscopy had no role to play as regards prognosis. However in the remaining six it clinically influenced surgical management (10 percent). In such cases arthroscopy disproved clinical diagnosis. These were mainly with tears of lateral meniscus.

In one patient of a popliteal cyst, visualization of the significant posterior horn lesion through the arthroscope

confirmed the need for arthrotomy and menisectomy. In the remaining patients in this group, loose body was found and removal was carried out through a separate puncture under arthroscopic control. The clinical diagnosis was also correct in 22 patients in whom all adjunctive diagnostic evidence was conflicting. In a majority of these patients the arthrograms were misleading but arthroscopy confirmed the clinical diagnosis.

Incomplete Clinical Diagnosis.- The clinical diagnosis was correct but incomplete in four patients. In two the clinical diagnosis of a medial meniscal tear was supported by arthroscopy and in addition the lateral meniscus was also torn. Additional meniscal lesions were found in two patients. In one the clinical diagnosis was tearing of the lateral meniscus and chondromalacia patella, arthrographic findings were normal, whereas arthroscopy revealed a tear of both the medial and lateral meniscus confirmed by arthrotomy. In another patient with a clinical diagnosis of tearing of lateral meniscus, the anterior cruciate ligament was also torn.

Incorrect clinical diagnosis.- The clinical diagnosis was incorrect in 11 patients. In eight both clinical and arthrographic diagnosis were in error, but the correct

diagnosis was apparent at arthroscopy. In one of these cases, a lateral tibial plateau chondral fracture was diagnosed arthroscopically and by arthrotomy. The clinical diagnosis was a loose body and the arthrogram was normal. In another case the arthrographic and clinical evidence indicated a retained posterior horn. Arthroscopy through the posteromedial approach with a Dyonics needle scope showed that subsequent arthrotomy revealed chondromalacia patellae and chondromalacia of medial femoral condyle.

Arthroscopy without arthrotomy.- In addition to 96 patients who underwent arthrotomy, two operative procedures carried out through the arthroscope and four extra procedures, there were 18 who underwent arthroscopy but in whom arthrotomy was deferred because the arthroscopic findings were normal (seven patients) or revealed lesions not appropriate for surgery (seven chondromalacia, one torn anterior cruciate ligament that was not repairable, one adhesion, three chronic synovitis and one osteoarthritis). All these patients were followed for 12 months to 2 years, and only two subsequently required arthrotomy. In one case, the clinical diagnosis was tearing of the medial meniscus. Arthroscopy by the anterolateral approach suggested a normal knee but the patient continued to have symptoms. Subsequent arthrography demonstrated a peripheral tear of the medial meniscus, posterior horn.

Another patient who subsequently required arthrotomy was clinically diagnosed as having a medial meniscus tear. The arthrogram was normal and the medial meniscus appeared normal arthroscopically except for degenerative changes involving the anterior horn. The patient was followed conservatively, but continued to have symptoms. Arthroscopy was repeated two months later and a tear of medial meniscus was found. Most likely the meniscal tear was present but not detected initially.

Preliminary arthroscopies in patients with persistent symptoms involving the knees prevented unnecessary arthrotomies in 18 of these 20 patients.

Accuracy of arthrography.- Arthrographic evaluation of meniscii was 80 percent accurate for the medial meniscus with three false negatives. For the lateral meniscus, the accuracy was 61 percent with three false positive and false negative arthrograms were compared with the actual lesions found at arthroscopy and arthrotomy.

Arthroscopic errors.- These were encountered in four patients. In the first patient a chondral fracture of the patella appeared on arthroscopy to be chondromalacia of the patella. In this case the clinical diagnosis was a chondromalacia patellae and the arthrogram was normal. In the second

patient a torn medial meniscus appeared by arthroscopy to be a degenerated meniscus. In this case the diagnosis was a medial meniscus tear and the arthrogram was normal. This patient continued to have symptoms and subsequently underwent arthrotomy and menisectomy. In the third patient, a tear of the anterior horn of the medial meniscus appeared by arthroscopy to be synovitis. In the fourth patient a posterior peripheral tear of the medial meniscus could not be visualised arthroscopically through the anterior approach. The subsequent arthrogram was positive. The tear could have been seen if the posteromedial approach had been utilized before the anteromedial or antero lateral puncture procedure. Among 73 medial meniscal tears posterior peripheral tears that were not observed by the anterior approach were demonstrated by the posteromedial approach in three patients. In these three patients, arthrography was positive in one and negative in two.

Discussion - Arthroscopy is a practical and valuable procedure with minimal morbidity. A correct diagnosis was made in 92 of 96 cases (96 percent) in which arthrotomy was performed. Unnecessary surgery was avoided and doubtful diagnosis confirmed before arthrotomy. This included 62 of 120 patients (52 percent). When an unexpected diagnosis was made or when definitive treatment was carried out through the arthroscope,

the procedure was considered to be very useful. This was found in 31 cases (26 percent). In 32 cases the clinical and arthrographic diagnosis were incorrect or conflicting, and arthroscopy provided a definitive diagnosis in 31. This ratio is similar to that reported by Jackson and De Haven.

A statistical analysis of 98 cases in which diagnosis were confirmed by arthrotomy revealed that arthrographic diagnosis corrected an erroneous clinical diagnosis in only 5% of the cases, whereas it incorrectly changed the clinical diagnosis in 24 percent of cases. Similarly a cross tabulation of correct versus incorrect diagnosis demonstrated a statistically significant agreement between the clinical diagnosis and arthrographic results both when correct and incorrect ($X^2 = 5.35$ $p = 0.02$) Standard corrected chi square test.

These correlations indicate that the majority of patients in this study no further significant diagnostic information was provided by arthrography after clinical examination as performed in that hospital.

Contrarywise, the diagnostic accuracy of combined anterior and posterior approach arthroscopy was higher and statistically independent of the results of both clinical diagnosis ($X^2 = 0.01$, $p = 0.90$) Standard corrected chi square test and arthrography ($X^2 = 0.37$ $p = 0.54$) Standard corrected chi square test, revealing its important contribution to the

anatomic diagnosis above and beyond that provided by the clinical examination and arthrography.

The diagnosis of meniscal tear by arthrography has been difficult, although the technique for obtaining high quality double contrast arthrograms is well established.

It is generally agreed that the articular cartilage, the anterior cruciate ligament and synovial lining are difficult to evaluate by arthrography but are readily visualised at arthroscopy. Arthroscopic examination can be used in presence of flexion contracture and haemarthrosis, which often make arthrographic examination difficult. The inferior surface and the periphery of the meniscus are inaccessable to the large diameter arthroscope but can be readily visualised utilizing the small diameter arthroscope, with or without manipulation of intra-articular structures or by well performed arthrography. Lesions of the posterior horn of the medial meniscus partially covered by the medial femoral condyle can be difficult to visualize even during arthrotomy, but the diagnosis can be inferred during arthroscopic observation by protrusion of the meniscus from beneath the femoral condyle, by abnormal acute folding of the meniscus seen on the anterior approaches, by posterior puncture using a small diameter arthroscope, or by precise arthrography.

With experience, a combination of multiple approach arthroscopy, and arthrography in selected cases should increase preoperative diagnostic accuracy to almost 100 percent.

S. Ward Cascells in his article presents somewhat subdued role of arthroscopy in clinical diagnosis. He suggests arthroscopy be used in -

1. Miniscal tears and defects in articular cartilage.
2. Follow up of patients who have had prior surgery e.g. patillectomy, menisectomy etc.
3. Visualisation of patello femoral relationships during movements of the knee joint.

Cascells experience with the arthroscope seems to suggest that all structures within the knee joint are accessable to the arthroscope with exception of posterior crucial ligament and poplitial area. It often happens that signs and symptoms appear to suggest a medial meniscus tear whereas arthroscopy proves it to be a tear of posterior horn of the lateral cartilage.

According to Cascells, the diagnosis is substantially correct in 80% of cases with 7.5% false positives and 4% false negatives. The false positives were due to strands of tissue which floated around in the saline-filled joint.

The false negatives occurred in meniscal tears.

Arthroscopy proved to be of considerable value in recurrent dislocation of patella, since it can visualise the anterior surfaces of femur - an area not visualised by X-rays. In positive cases the anterior surface of lower end of femur was seen to be flat or even convex.

COMPARISON OF RESULTS OF ARTHROSCOPY UNDER GENERAL AND LOCAL ANAESTHESIA

John B. McGinty and Richard A.Matzer compared results of arthroscopy with general anaesthesia and local anaesthesia. In their series arthroscopy was 91.1% accurate when general anaesthesia was used and 95.2% with local anaesthesia. Thus they sum up their findings with a view that no material advantage can be had by general anaesthesia over local anaesthesia so far as arthroscopy is concerned. In this connection it must be noted that Watanabe stresses that to observe the menisci general anaesthesia should be used to achieve full muscle relaxation.

Problems encountered with local anaesthesia are:-

1. Pain on passage of Trocar through the capsule. For this more local anaesthesia is injected locally.

2. Difficulty of entering the knee with blunt Trocar because patients tightens quadriceps. Patient has to be asked to relax.

3. Pain during procedure. More xylocaine is infiltrated.

Post operatively a compression dressing is done and patient discharged immediately. Patient is advised to remove the compression dressing within 48 hours. Patient can return to work the day following arthroscopy.

In 297 knees examined under local anaesthesia by McGinty and Matzer no complications were seen. In children below 10 years of age general anaesthesia is preferable.

A COMPARISON OF THE EFFECTIVENESS OF ARTHROSCOPY/ARTHROGRAPHY

Robert W. Jackson and Kenneth E. De Haven have listed the advantages of arthroscopy over arthrography. Arthroscopy has the advantage of visualising structures not demonstrated by arthrography. These include articular surface of patella and the patellar groove of the femur, lateral miniscus and anterior cruciate ligaments. In addition arthroscopy provides better visualisation of structures than arthrotomy. These include posterior horn of the meniscii, the compartment

opposite to the arthrotomy incision and the functional relationship of the patella and femur.

Continuation To Arthrotomy.- If one wishes to perform arthrotomy following arthroscopy, it is wise to reprepare and redrape the joint as though it were a fresh case.

INDICATION OF ARTHROSCOPY.- The main indication is the problem knee for which no accurate clinical diagnosis can be made. Typical of this group are:-

(a) Females who have vague poorly localised pain with minimal objective findings.

(b) Knees in which surgery has been performed but symptoms still persist.

(c) Where objective evidence is conflicting and confusing.

(d) Pre-arthrotomy arthroscopy not infrequently yields information which enables one to modify or even forgo surgery.

(e) In the arthritic joint there is often an unexplained beneficial effect of the procedure. This effect is probably due to irrigation of the joint leading to a break down of adhesions. This leads to less pain following arthroscopy.

Limitations.- There exist certain blind spots for arthroscopy - these are certain portions of the supra patella pouch,

periphery of patella, the inferior surface and periphery of meniscii, the posterior cruciate ligament and posterior capsule. Fortunately, most of these areas can be demonstrated by arthrography.

Contraindications:-

(a) Stiff knee which prevents the manipulation of the scope within the joint.

(b) Recent haemarthrosis - This is a relative contraindication.

Arthroscopy in the acutely injured knee

The resulting haemarthrosis makes examination difficult. Significant articular fractures of patella or femoral condyles can occur when X-ray films appear normal. Arthroscopy frequently provides the diagnosis. Diagnosis can also be made accurately in cases of meniscal tears.

Arthroscopy is indicated in cases of -

(a) Chondromalacia patellae

(b) Meniscal tears

(c) Remote tears of anterior cruciate ligament

(d) Loose bodies

(e) Avulsion of poplitial tendon

(f) Osteochondritis dessicans

(g) Arthritic knee

(h) Diseases of synovial membrane (for accurate biopsy)

Role of arthroscopy in Arthritic Knee.- In a grossly degenerative knee, as seen by the arthroscope, a shaving procedure would be of little value. In a moderately degenerative knee with semicompartmental disease, a high tibial ortiotomy may be helpful.

Mc Ginty and Freidman (M.D.) advocate strongly the use of arthroscope in cases of meniscal tears. Often normal menisci are removed which can be followed by osteo-arthritis, retained meniscal fragment or instability of knee as well as other complications attending any major surgery such as infection, thrombophlebitis, pulmonary embolism etc.

Arthroscopy in the Arthritic Knee.- Inevitably, the rationale of arthroscopy in the arthritic knee will be questioned. The diagnosis is certain, the treatment remains the same - so why resort to arthroscopy ? The answer to this vexing question is supplied by Robert W. Jackson who concentrated his efforts on arthroscopy of the arthritic knee and may be considered to be an authority in this field. Jackson convinvingly proves that more information can be gathered with arthroscopy than with arthrotomy. He stresses on the early detection and

correction of biomechanical alterations leading to arthritis.

These can be grouped into three categories:-

1. Conditions that block the normal synchronous movement of the joint.

2. Conditions which produce abnormal pathways of motion.

3. Conditions that cause stress concentration.

Conditions that block normal movements - Torn menisci, loose bodies, intra-articular fractures, infarcted and painful fat pads.

Conditions that cause abnormal pathways of motion - Traumatic lesions that produce instability (ligament capsule, muscle) retained meniscal fragments, Subluxated patella.

Stress concentration - Obesity, varus, valgus deformities, soft tissue contractions, prolonged splinting, painful muscles.

One fairly common sequence involves the development of indirect and chronic stress on the patella and follows removal of medial meniscus. Possibly a slight angulatory deformity occurs which in turn subjects the patella to chronic abnormal stress producing chondro malacia.

Principles of treatment

1. Prevent the development of degenerative changes by early restoration of normal function. This is done by early

detection and treatment.

2. Retard or reverse the progress of degeneration.

3. In advanced cases try to improve function.

Role of Arhtroscopy in Arthritic Knee

1. Detects pathology earlier than other diagnostic means.

2. Appropriate pre-planning of surgical treatment can be done.

3. The avoidance of unnecessary and harmful intra-articular surgery.

4. Treatment in some limited instances.

5. Follow up and research.

Early detection.- of articular cartilage and meniscal tears.

At arthroscopy, chondro-malacia of patella is diagnosed with ease as the degenerative and fibrillated articular cartilage is clearly visible in the stream of irrigating fluid.

Articular cartilage erosions involving femur are frequently found in conjunction with retained posterior horn fragment. Varus and valgus deformities, anterior cruciate instability. One can also recognise fresh chondral fractures overlying intact subchondral bone. There are usually flap like fragments that lift clear of the bone and which may

interfere with the normal range of movement.

The isolated anterior tear can be detected and appropriately treated at an early stage.

Synovial entrapment, originally described by Hoffa, can also be appreciated. This consists of nipping of the sensitive synovial frond in the anterior compartment of the joint. The synovium becomes thickened and fibroid and thus becomes more vulnerable to trauma. This vicious cycle can be broken by a period of relative rest associated with anti-inflammatory drugs. Occasionally a limited synovectomy is indicated.

Pre-planning appropriate surgical treatment

Conditions that mimic a torn meniscus are - rupture of poplitous tendon, isolated anterior cruciate tear, chondral fractures, crystal synovitis, dislocating menisceii and cartilaginous loose bodies.

If a progressively deteriorating joint shows a normal compartment on anthroscopy, the surgeon would be justified in proceeding with a high tibial osteotomy so that the normal compartment takes on the excess load. If both compartments are affected the surgeon may do arthroplasty or arthroclesis.

In rheumatoid diseases, synovectomy has been shown to be of some value provided the articular cartilage is not

involved. Arthroscopy can help determine this.

In chondro-malacia patellae, if both sides of the patello femoral joint are affected, patellectomy may be planned. Where only the patella is involved shaving might be indicated. In the earliest stage with minimal fibrillation conservative treatment with high dosage of salicylates should be begun.

Avoidance of harmful surgery - Normal menisci should not be removed. Arthroscopy helps make an accurate diagnosis. 55% of knees that were original candidates for surgery were not operated upon following arthroscopy.

Treatment.- Limited amounts of treatment can be carried out through the arthroscope. Small loose bodies or meniscal fragments can be removed by forceps through the sheath of arthroscope. Pseudo gout responds well to irrigation procedure.

Polypuncture Technique

Whipple and Basset (M.D.) have described a per cutaneous method of manipulation of intraarticular structures combined with the procedure of arthroscopy. Many limitations of conventional arthroscopy of the knee have been overcome through development of techniques that permit manipulation of intra-articular structures through paired coordinated entry sites.

Ten accessory entry sites are described. This increased the accuracy and reliability of diagnostic arthroscopy of knee.

With the conventional technique the arthroscope is inserted adjacent to the patellar tendon. Other entry sites - postero-lateral, postero medial and patella tendon have been described to supplement the anterior approach. Conventional arthroscopic techniques may be limited in five ways.

1. The arthroscopic vision may be limited by hypertrophic synovium, infra pateller fat pad, free-floating synovial and cartilaginous debris.

2. The wide angled parabolic lens with which most modern arthroscopes are equipped magnifies the visual field and distorts the examiners estimation of size and shape.

3. Depth of perception is compromised by the monoculus system.

4. The integrity and mobility of the meniscii or cruciate ligament often cannot be appreciated by simple visual inspection because torn or avulsed structures may fall back into their anatomical positions.

5. Without the advantage of tactile perception lobulated synovium may masquerade as distorted synovium and the distinction between fibrillated articular cartilage and exposed subchondral bone may be impossible.

By employing accessory instruments to manipulate the inter articular structures under arthroscopic visualisation and by using several points of entry, these limitations have been overcome in most cases.

By appropriate combinations of entry sites, a system was devised to permit access to each region of the joint from two vantage points simultaneously - one through which a given structure could be palpated or grasped and another through which the manipulation could be observed through the arthroscope. A sturdy spinal needle or a small Steinman pin may be used for the polypuncture technique. A pneumatic tourniquet should be used.

Lesions not appreciated on routine arthroscopic examination were identified in 20 of the 58 knees examined with the poly puncture technique.

Arthroscopic Surgery - Two Japanese, Hiroshi Aritomi and Makoto Yamamoto have pioneered the attempt to increase the range of the arthroscope from a diagnostic tool to an instrument of therapeutic abilities.

Electrical resectoscopes have been used to do surgery on the urinary bladder. This is nothing but a cystoscope equipped with an electrical surgical knife. The same idea was applied to the arthroscope and a new chapter in surgery was thus opened.

There are two types of resectoscopes, a punching type and an electric type. The electric type includes the Stern-McCarthy, Nesbit, and Iglesias models which vary structurally in method of controlling the surgical knife. Aritomi and Yamamoto employed the Iglesias type of resectoscope. This has a fore oblique type of telescope fitted with a loop. The loop consists of a semi-circular tungsten wire which extends between two insulated conductors through which a high frequency current flows. In a non-electric fluid, resection of tissue and haemostasis can be achieved. The shape of the loop varies according to its purpose. It may be made in the form of a button, a rod, a hook or a semi-circular plate.

The working element - The working element consists of a structure that controls the loop. It is fixed to the fore oblique telescope and fits within the sheath. During manipulation of the instrument, the loop moves into and out of the field of vision.

Pressure on the operating handle causes the loop to move towards the distal tip of the fore oblique resectoscope. When pressure is released, the loop returns to its initial position. Electrical current is supplied by means of an appropriate connection.

The Sheath

The sheath consists of a silicone cylinder with a beak like distal tip, which protects the fore oblique telescope and loop. The irrigating fluid flows through it. A spring catchlock secures the working element within the sheath. The resectoscope and the loop are protected from damage as they nestle within the protective tube which extends 1 m.m. beyond them.

The Operative equipment: A power source for the loop and appropriate cutting and coagulating currents are necessary to carry out surgery. The high frequency current produced by this instrument varies from 1.5 to 5 megacycles. Resection and coagulation are made possible by the current that passes

between the electrode and the tissue. The tube oscillating circuit generates the cutting currents, and the spark gap oscillating circuit generates the coagulating current, while the blended current produced by mixing the two currents coagulates as well as resects. Switching from one of these currents to the other is controlled by a foot pedal. The metal plates needed to complete the electrical circuit should be as close as possible to the area of surgery.

When synovectomy with the electric resectoscope is proposed, the patient is placed in a supine position. Any form of anaesthesia may be used. Adequate joint distension with a non-electrolytic irrigating solution is essential. During synovectomy the loop is fully extended into the field of vision. As the device is gently pressed against the synovial membrane, the cutting current is used for resection of the diseased tissue. Because of its fragility the loop must be manipulated with extreme gentleness. Any tissue that adheres to the loop must be removed. Removal of loose bodies has also been attempted after cutting the stalk. Gentle manipulation of the wire loop with the aid of a small grasping forceps is essential.

The red turbidity caused by bleeding from the site of resection can usually be controlled by adequate irrigation. Active bleeders require coagulation. Areas that present

limited accessability may often be treated by blending the cutting and coagulating currents. The fully extended loop will usually reach these sites.

When resection is satisfactory, the inside of the joint cavity is washed out fully with physiologic saline solution or irrigating fluid to remove the resected tissue and blood clots. The wound is then closed. The patient can be discharged on the fourth post-operative day.

Clinical Results: Patients were divided into three groups. In 13 cases the aim of the operation was observation ofthe surface of the synovial membrane and biopsy. In six other cases resection of the anterior synovial membrane and debridement were carried out following establishment of the diagnosis by biopsy. In 27 cases the operation was carried out because of chronic rheumatoid arthritis with observation of progress.

The indications of operation in these patients were marked symptoms of inflammation, such as pain, swelling of the knee joint or effusion.

The follow up period after operation was five months to six years. In order to determine the amount of synovial membrane resected and its effect, scanning of the joint with

99 m Technetium pertechnetate was performed. In some cases the uptake was markedly reduced compared to preoperative uptake. These findings coincide with the subsidence of inflammatory activity.

After operation, the range of joint motion returned to its initial degree in most cases. Rapid recovery was noted in four to five days and in the delayed case in about 10 days. In some cases the range increased, whereas in other cases a slight loss of approximately 10 to 20 degrees was noted. Significant atrophy or decrease in power of the quadriceps femoris was not observed.

MENISCUS SURGERY - Hiroshi Ikeuchi produced excellent results by carrying out partial meniscectomy under arthroscopic control. Long term immobilization and the post-operative sequalae of arthrotomy were for the most part decreased by the procedure.

In a study of 93 joints 77.4 percent of the anterior horns of medial menisci were attached to the tibia. The remainder joined the transverse ligament, plicae and the other ligaments. All posterior horns of medial menisci were attached to the posterior intercondylar area of the tibia. The anterior horn of the lateral meniscus was found to be attached to the lateral tibial plateau in all cases.

The posterior horn of the lateral meniscus was attached to the tibia in 96.8 per cent of cases. In the remaining cases it joined the ligament of Wrisberg or ligament of Humphry or it was transferred to the posterior longitudinal septum through the capsule around the attachment of the posterior cruciate ligament in the posterior intercondylar area.

The posterior segments of both menisci are attached to the capsule at the level of joint line. The resultant space between tibia and menisci permits mobility at this site. However, the mid portion of the medial meniscus is fixed firmly to the capsule. On the other hand fixation of the mid portion of the lateral meniscus is relatively loose, because of intervention of the popliteal tendon and its groove. At this point the femoral side of the meniscus is free and its tibial side is attached by a thin ligament.

Instruments: Rigid sliding scissors. In partial menisectomy the straight scissors and forceps are used. In total menisectomy thin curved scissors, two pairs of freely flexible scissors, a tenotome and an elevator are also employed.

Site of insertion:

(a) Two puncture method.- Usually the arthroscope is inserted through the infra patellar approach on the side

opposite the site of surgery. The surgical instrument is introduced through either the anterolateral or the anteromedial approach in the surgical site.

(b) Three puncture method.- The infra patellar and the antero lateral or anteromedial approach are used to introduce the arthroscope and the surgical instrument. The combination of approaches used depends upon the surgical field. Follow up studies showed no difference in result with the three puncture method and the two puncture method. The three puncture method is generally preferred because traction is easily applied and there is no chance of losing a detached flap, even in performing a partial menisectomy.

Originally partial menisectomy was limited to correction of L shaped tear and the bucket handle tear. Later it was found that other types of tears could be corrected provided the periphery of the meniscus was undamaged.

When there are no uninjured parts of the meniscus remaining in the joint space or when the tear of the meniscus reaches parameniscal area, total menisectomy is indicated.

Semiarthroscopic total menisectomy combines arthroscopy and arthrotomy. This procedure is used in cases in which a complete discoid meniscus is associated with too narrow a joint space to allow the introduction of surgical instruments

or in complex meniscal tears with fragments that obscure vision.

Procedure: Epidural anaesthesia was used for all cases.

Total menisectomy:

1. The arthroscope is inserted through the infra-patellar approach from the side opposite the surgical site.

2. The site for introduction of the surgical instrument is determined by palpation of the area of the infra-patellar approach or the transitional area between the anterior segment and the middle segment. A small stab wound parallel to the joint line is made in the skin. A needle is introduced under arthroscopic visualization to verify the location of the site and the stab wound is then completed through the capsule.

3. A long handled tenotome is then introduced and the meniscus is detached peripherally. Careful palpation with the instrument prevents damage to articular cartilage.

4. Manipulation of the meniscus with an elevator is used to confirm its separation. Thin scissors are then inserted.

5. The anterior horn is then divided with the scissors.

6. Traction is then exerted on the detached portion of the meniscus by means of forceps. The posterior peripheral

portion is then separated by means of thin scissors.

7. Continued anterolateral traction is exerted on the detached portion of the meniscus and its remaining posterior horn is divided with scissors.

8. Traction on the meniscus with forceps facilitates surgery. The separation is affected from the medial or lateral aspects.

9. The meniscus is removed through the site of insertion of the surgical instruments.

10. Completeness of surgery can be checked by visualizing the operative area.

Points to be kept in mind:-

1. Avoid obstruction due to a torn flap or partly resected meniscus.

2. Traction on the meniscus with forceps anteriorly or laterally is effective in insuring a clear view for performing surgery.

3. If the detached part hinders surgery, it may be taken out piecemeal to widen the space for surgical manouvering. Completion of the surgery in a reasonable period of time is important.

4. A tourniquet is convenient.

5. It is difficult to clearly cut the paramenisoal area of the posterior segments especially when this part is cut with the knee joint flexed, since it comes down posteriorly into the popliteal space, and after the separation it must be confirmed in an extended position. In this position the posterior part will be anterior.

Semi arthroscopic Total menisectomy (Combined arthroscopy and arthrotomy): When arthroscopic total menisectomy was too difficult to complete within two hours, the capsule was opened and total menisectomy carried out.

Results:

Out of 82 cases only 6 percent required a reoperation and complications developed in 4.8 percent of cases. Complications were the following:-

1. Damage to intra-articular tissue. Surface of the cartilage may show fibrillation changes. These do not however cause any serious problems.

2. Bleeding - This obscures vision. Hence tourniquet is advisable.

3. Damage to surgical instruments or arthroscope.

MATERIAL

THE ARTHROSCOPE AND METHOD OF ARTHROSCOPY

A. MATERIAL

B. BASIC INVESTIGATIONS IN ARTHROSCOPY

C. THE ARTHROSCOPE

D. TECHNIQUE OF ARTHROSCOPY

E. PHOTOGRAPHY

F. PUNCH BIOPSY

G. COMPLICATIONS OF ARTHROSCOPY

THE MATERIAL

We resorted to arthroscopy in several varied pathological conditions of the knee. These range from acute trauma to chronic degenerative conditions of the knee. More specifically we used arthroscopy as an investigative weapon in the following conditions.

1. Meniscal tears
2. Loose bodies
3. Osteo chondritis dessicans
4. Chondro malacia patella
5. Remote tears of cruciate ligaments
6. Arthritic knee
7. Infective conditions - Tuberculosis and suppurative.

It must be noted that in acute trauma where haemarthrosis of the knee resulted, arthroscopy is not very convenient since the blood obscures the vision and lesions are thereby effectively concealed.

The commonest material that we obtained was that of tuberculosis. It will be noted that a preponderance of our cases were tuberculous in nature. The break up of the cases was as follows:-

Disease	Percentage of Cases
Tuberculosis	35.0%
Osteo arthritis	10.0%
Loose bodies	5.0%
Osteo chondritis dessicans	-
Chondro malacia patella	-
Rheumatic arthritis	10.0%
Trauma of Knee (Including miniscal and cruciate ligament tears)	15.0%
Septic arthritis	25.0%

THE ARTHROSCOPE AND METHOD OF ARTHROSCOPY

A. BASIC INVESTIGATIONS IN ARTHROSCOPY

In 1940, Miki carried out research with view of optimum conditions required for arthroscopy. He found that the best medium required to dilate the cavity of the knee joint was normal saline at a temperature of 33° - 35°C at a pressure of 50-70 cm. of water. Under these conditions Morisaki made a surprising finding that circulatory condition of synovial blood vessels was hardly affected by the conventional therapy such as warm saline fomentation or massages.

B. THE ARTHROSCOPE

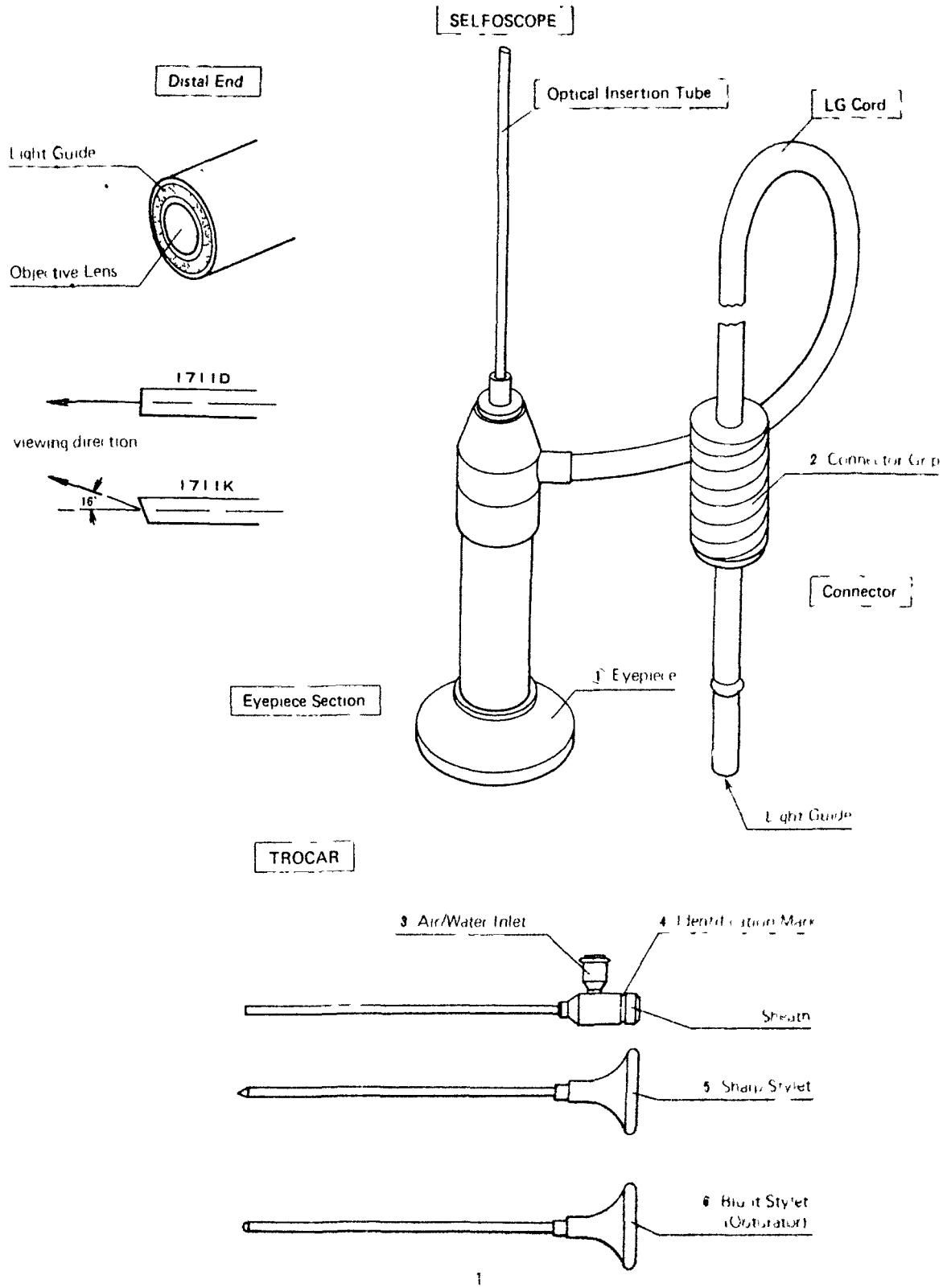
DEVELOPMENT.- To fully appreciate the modern arthroscope it becomes essential to understand its evolution from the first

arthroscope Takagi used in 1918. Takagi's arthroscope used a system of lenses with a bulb at the end. When Takagi retired, the responsibility of the research fell on Watanabe's shoulders. Watanabe started from scratch and used a simple steel tube with a bulb incorporated. This however gave a very limited view.

In 1951, Sato, Watanabe and Takidu modified a 4.0 mm. cystoscope meant for children. This was then called No.13 cystoscope. It however had a disadvantage that observation of the meniscii and colour photography were impossible. No.14 Arthroscope, designed in 1954, was especially constructed to meet the demands of colour photography. The outside diameter of such an arthroscope was 8.2 mm. Visualizing the meniscii remained the bug-bear of the procedure.

The No.15 arthroscope had a dual purpose of arthroscopy of a child's knee and myeloscopy in cases of meningocoel.

In 1959 the No.21 arthroscope was developed with which both colour photography and visualization of meniscii could be done. This eminently successful arthroscope consisted of two telescopes for both direct and side viewing. The direct viewing telescope and a bulb carriers were nested within the same sheath and the bulb carrier, outside the sheath functioned


SELFOSCOPE
Distal End
Light Guide
Objective Lens
1711D
viewing direction
16°
1711K
Optical Insertion Tube
LG Cord
2 Connector Grip
Connector
Eyepiece Section
1 Eyepiece
Light Guide
TROCAR
3 Air/Water Inlet
4 Identification Mark
Sheath
5 Sharp Stylet
6 Blunt Stylet
(Obturator)

as a retractor, which is essential for observing the meniscii. The side viewing telescope, however, was found inadequate for viewing the meniscii and was replaced by a new wide angled, fore-oblique viewing telescope in 1975.

A No.22 arthroscope was designed without a bulb, in which a glass fibre illumination system was used. Due to lack of retractor function, the No.22 arthroscope fell into disuse. A bulb carrier outside the sheath functions as a retractor which is essential for successful arthroscopy of the miniscus. Recently they have attached glass fibre light guide with a retractor carrier which functions solely as a retractor.

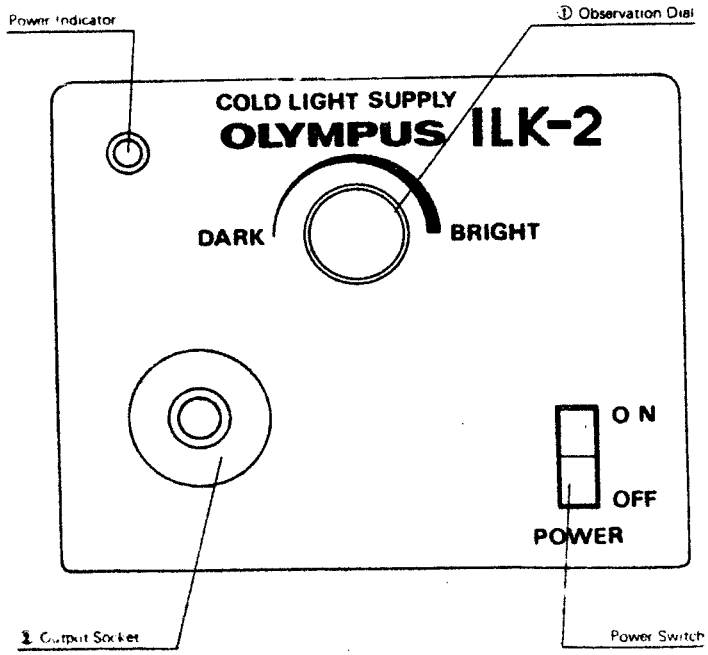
SOME DETAILS OF THE ARTHROSCOPE WE USED

The Arthroscope we used is the Olympus SES 'Selfoscope' which uses 171 I.D. and 171 IK optical invertion tube. The 171 ID is forward viewing type, the angle of view being 55°. The 171 IK is a forward-oblique viewing type with 16° tilting, the angle of view being 75°. The lighting method is a light guide system through a fibroscope from an Olympus ILK-2 cold light supply.

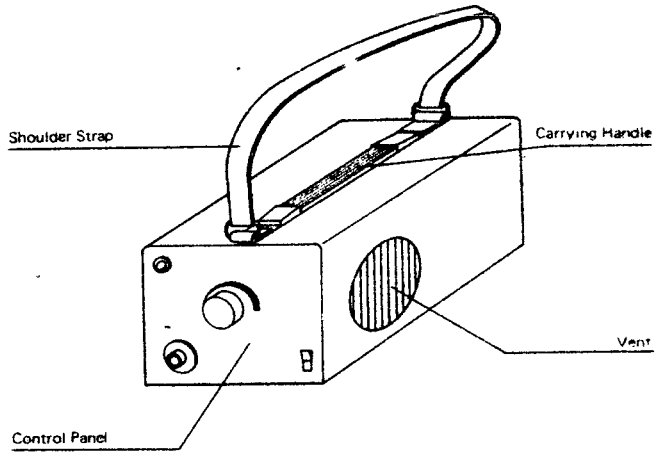
Magnification with No.1 telescope is ten times at a distance of 1 m.m., double at 1 cm., equal at 2 cm., growing

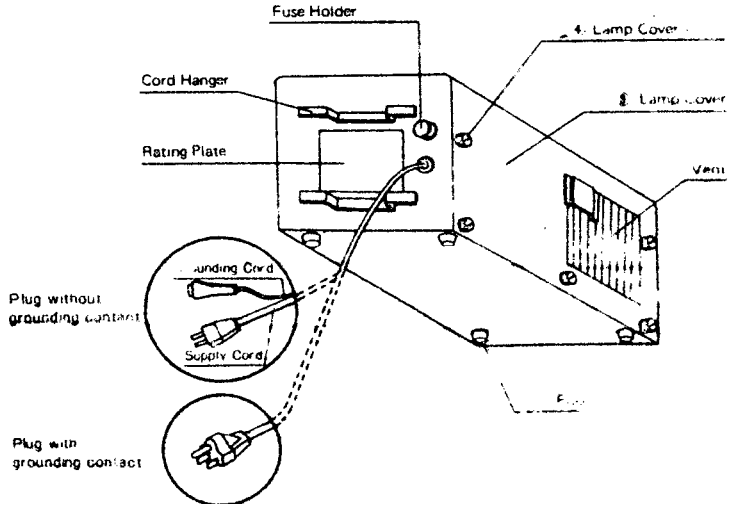
2. NAME AND FUNCTION

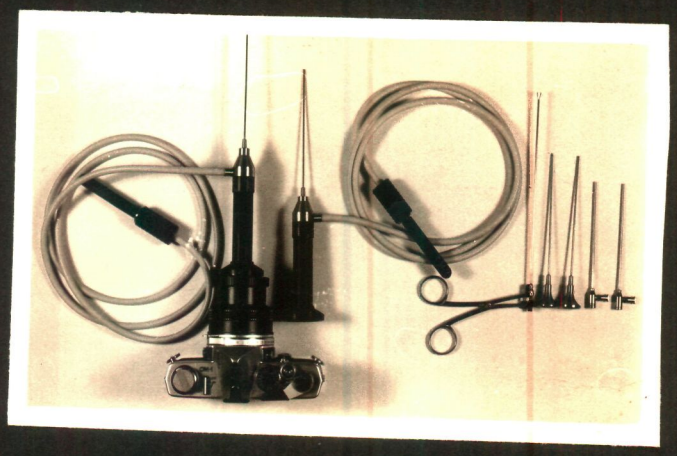
Control Panel



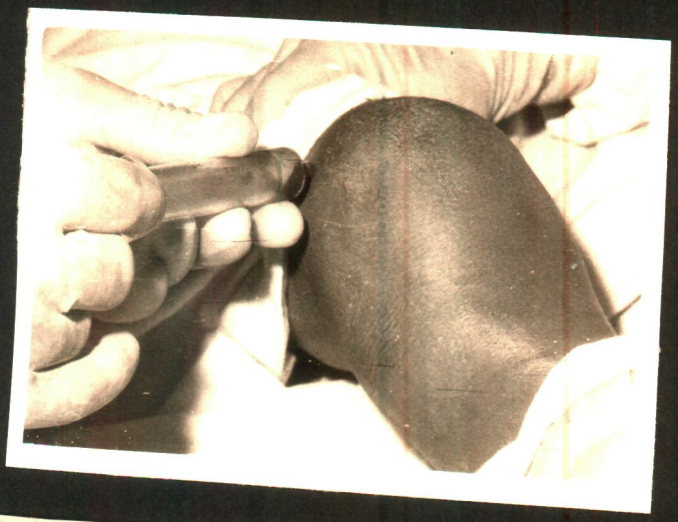
Body



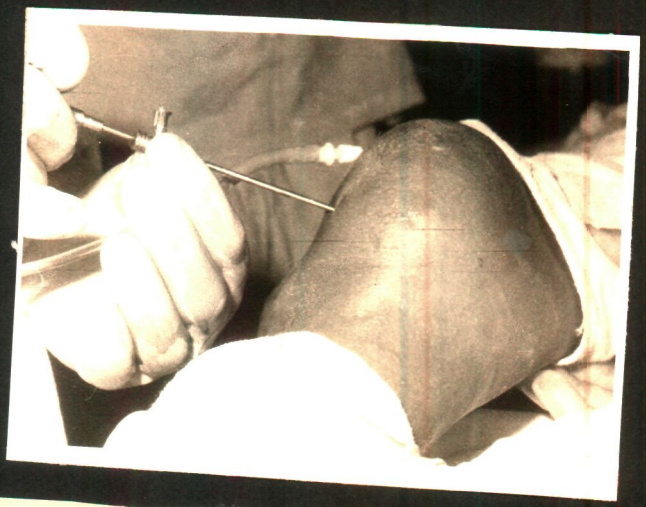




The Arthroscope and its accessories. One arthroscope is shown articulated with the camera.



Aspiration of the knee joint. The effusion is removed and 80 ml of saline introduced into the joint.



Introducing the trocar and cannula.

TECHNIQUE OF ARTHROSCOPY

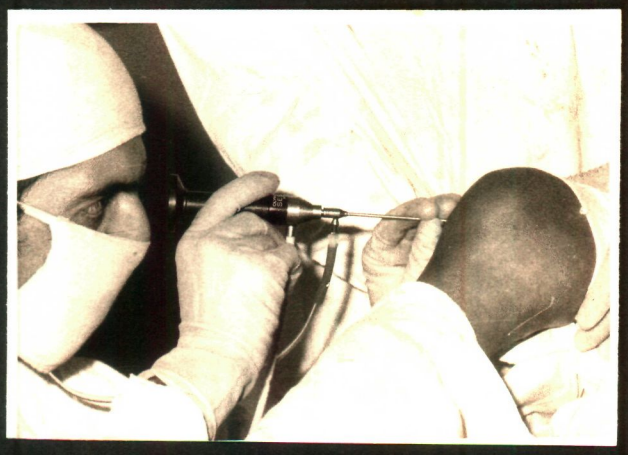
Asepsis - Strict asepsis must be maintained. The telescopes, bulb camera, conducting cords and the light guide should be sterilized by 24 hours of exposure to formalin. The camera may also be similarly sterilized though the film can be damaged by this procedure. Alternatively Glutraldehyde (Cidex) may be used for sterilisation.

Anaesthesia - Any form of anaesthesia, ranging from general, spinal or local may be used. For arthroscopy of the meniscus, where full muscle relaxation is of essence, general anaesthesia must be used.

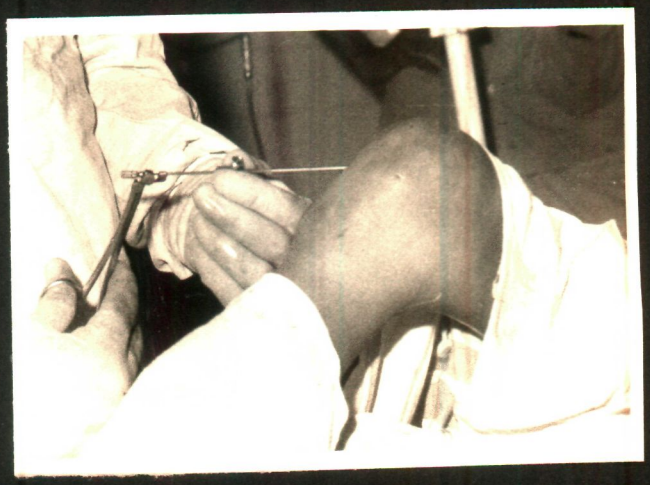
Tourniquet - Generally not used.

Arthroscopic Procedure - A needle (18 gauge) is inserted into the supra patella pouch and any effusion is aspirated. The joint is distended with 75-100 ml of normal saline. A rubber tube with a controlling stopper is then attached to the needle to be used as a drain pipe during the examination.

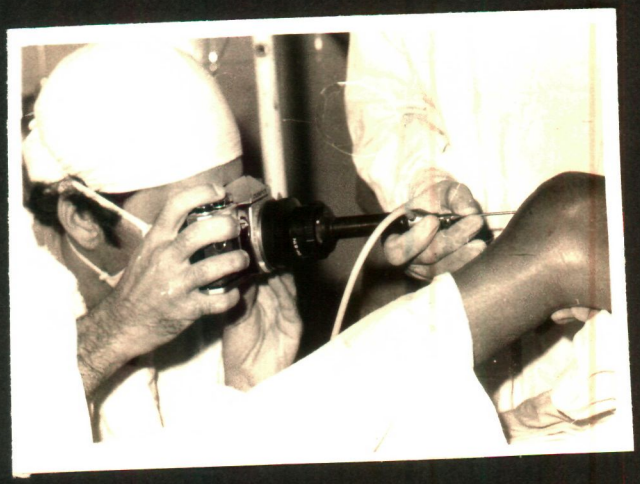
The knee is flexed at 20°. The joint line is palpated with both thumbs. The Trocar puncture is made in the extended knee position. The trocar is first inserted through a skin incision 6-8 mm. wide into the supra patella pouch. It has to be directed in a postero-mideo-proximal direction if the



Viewing the interior of the knee-joint.



Taking a punch biopsy.



Photographing the interior of the knee joint.

lateral approach is being used. The trocar slides up the patella groove into the supra patella pouch.

A bottle of saline is placed approximately 80 cm. above the joint line and the system is attached to the cock of the sheath. The cock is closed, the trocar withdrawn and fluid flows out of the sheath. This confirms that the tip of the sheath is indeed in the supra patella pouch. The bulb carrier and the telescope is placed within the sheath. The electrical system for the bulb is attached and the transformer is switched on. The examination is conducted under continuous irrigation with normal saline. If a Cl-type No.21 Arthroscope is used, the light guide is attached on to the light unit.

The supra patella pouch is examined with the knee in the extended position. The instrument is withdrawn slightly and the knee flexed through 20° thereby allowing the examiner to observe the patello-femoral relationships. To observe the condition of femoral surface of patella it is best to use fore-oblique viewing telescope instead of a direct viewing telescope.

The knee is now further flexed to 60-90° simultaneously providing a valgus strain to open up the medial compartment. The arthroscope is moved along the medial ridge of medial condyle in a down-ward fashion till the anterior part of the

medial meniscus comes into view.

The knee is once again extended and the tip of the scope returned to supra patellar pouch. Varus strain is applied to the knee and the lateral compartment is now observed. To observe the lateral meniscus the knee should be flexed to 60-90°.

Thus we see that the medial and lateral meniscii can be adequately immobilised with gentle extension and flexion, external and internal rotation of tibia and with slight valgus or varus strains.

At times it may be necessary to apply traction on the meniscus with the help of a pair of forceps introduced into the joint. This sometimes reveals hidden meniscal tears.

After observing other structures in the lateral compartment e.g. cruciate ligaments, the tip of the scope is replaced into the supra patellar pouch.

Once the examination has been concluded 500-1000 ml of saline is used to thoroughly irrigate the joint. The skin incision is closed with a single stitch. An elastic Bandage is applied.

Photography

Whilst visual inspection is carried out under 6 volts of lighting photography is performed under 15 volts along with appropriate transformer and a synchronised exposure attachment - an automatic increase in illumination occurs when the shutter release is pressed.

With our equipment we used maximum intensity of illumination with a shutter speed of 1/8 sec. for 2 mm. and 1/4 sec. for 5 mm. using a 400 ASA film.

Punch Biopsy

A separate sheath is used to introduce the punch into the joint and the biopsy taken under arthroscopic vision. A large biopsy punch may be used to take a biopsy in a blind fashion.

COMPLICATIONS

1. Infection - If the usual strict asepsis is maintained the chances of infection remain minimal.

2. Injuries to cartilage and capsule of the joint - If knee joint is amply distended these complications do not occur. When moving the sheath inside the joint cavity an obturator instead of a trocar should be used.

3. Haemarthrosis and traumatic arthritis - Slight bleeding is inevitable. Haemarthrosis following manipulation with arthroscope is seldom extensive enough to warrant treatment.

Traumatic arthritis, following arthroscopy is of short duration.

4. Pain - Following arthroscopy patient may complain of a dull sensation in the knee. Since there has been trauma of tissue following arthroscopy pain is to be expected and patient is ordered 24 hours rest.

5. Quadriceps Inhibition - This always occurs following arthroscopy, though it is very minor and temporary.

6. Miscellaneous complications -

(i) Breakage of bulb - Arthrotomy should then be performed (This complication is avoided with the fibro optic).

(ii) Breakage of scissor tips etc. can be removed under arthroscopic control.

(iii) Bending of the tube.

FOLLOW UP OF ARTHROSCOPIC PROCEDURE

This is a vital aspect to arthroscopy to ascertain accurately the performance and the role of arthroscopy.

THERAPEUTIC VALUE

The mere washing of the joint cavity with saline results in improvement of symptoms. Miki, in fact, proposed a new method of therapy which he called 'Articular Pumping'. This method consists of filling the joint at a pressure of 70 cm. of water for about 6 seconds. The saline is rapidly withdrawn with a syringe till the pressure inside the joint falls to 20 cm. of water. This pressure is maintained for 12 seconds. This cycle is repeated several times. At the end of the procedure the fluid is withdrawn altogether. This system of therapy is useful in cases of traumatic arthritis, knee joint pain, osteo-arthritis, chronic synovitis, rheumatoid arthritis etc. The response in traumatic arthritis and chronic synovitis is excellent. In other conditions it ranges from good to fair.

OBSERVATIONS

OBSERVATIONS

The following observations are based upon the arthroscopies done on patients admitted to the wards of J.N. Medical College Hospital between the years 1980-1981. These observations were compared with other parameters of diagnosis, namely (a) clinical assessment, (b) Radiology, (c) Pathology. Thus the role of arthroscopy in the diagnosis of internal derangements of the knee is clearly defined. The operative and pathological findings were used as a criteria for the final diagnosis.

The total number of arthroscopies carried out were 20. The break up of the cases according to the age, sex and the disease process was as follows:-

Age groups:

TABLE 1

Age group (years)	No. of Cases	Percentage
1 - 5	-	-
5 - 10	1	5.0
10 - 20	2	10.0
20 - 30	4	20.0
30 - 40	10	50.0
40 - 50	3	15.0
50 - 60	-	-

Thus we see that the maximum arthroscopies were done in the age group of 30-40 years.

Sex ratio:

TABLE 2

Sex	No. of Cases	Percentage
Male	14	70.0
Female	6	30.0

TABLE 3

SHOWS SEX INCIDENCE AT DIFFERENT AGE GROUPS

Sex	Total No. of Cases	Years (Age group) 1-5	5-10	10-20	20-30	30-40	40-50
Male	14	-	1	2	2	6	3
Female	6	-	-	-	2	4	-

The Various Disease processes investigated Arthroscopically

TABLE 4

Disease Process	No.of Cases	Percentage
Meniscal tears	1	5.0
Fractures of femoral condyle	1	5.0
Cruciate ligament tears	1	5.0
Tears of collateral ligament	-	-
Tuberculosis	7	35.0
Septic arthritis	5	25.0
Osteoarthritis	2	10.0
Rheumatoid arthritis	2	10.0
Neoplastic	-	-
Loose Bodies	1	5.0
Chondromalacia patella	-	-

The maximum number of arthroscopies were done in tuberculosis of the knee.

Ratio of incidence of trauma and 'cold' cases

TABLE 5

History	No.of Cases	Percentage
Trauma	3	15.0
Cold	17	85.0

Duration of symptoms

TABLE 6

Duration	No. of Cases	Percentage
Less than 1 month	3	15.0
1-6 months	7	35.0
6-12 months	5	25.0
More than 1 year	5	25.0

Extent of lesion

TABLE 7

Extent of lesion	No. of Cases	Percentage
Minimum destruction	14	70.0
Moderate destruction	4	20.0
Severe destruction	2	10.0

Side on which Arthroscopy was done

TABLE 8

666

Side	No. of Cases	Percentage
Left	11	55.0
Right	9	45.0

The following observations provide an insight into the effectiveness of the arthroscope when compared with its peers in the realm of accurate diagnosis. The other parameters are clinical diagnosis, laboratory investigations, radiology and pathology. The operative findings and pathology provided the final diagnosis.

Diagnosis by Arthroscopy

TABLE 9

Disease	No.of Cases	Accurate diagnosis (Pathological/ operative)	Percentage
Meniscal tears	1	1	
Fractures of femoral condyle	1	1	
Fractures of Tibial condyle	-	-	70% accurate diagnosis
Cruciate ligament tears	1	1	
Tears of collateral ligaments	-	-	
Tuberculosis	7	5	
Septic arthritis	3	3	
Osteoarthritis	2	1	

Contd...

Table 9 continued

Rheumatoid arthritis	2	1
Neoplasms	-	-
Loose bodies	1	1
Chondro malacia patella	-	-

In contrast to our study some workers claim an accurary rate of 92%.

Diagnosis by Radiology

TABLE 10

Diseases	No.of Cases	Final Diagnosis (Pathological/ operative)	Percentage
Meniscal tears	1	-	
Fracture of Femoral condyle	1	1	
Cruciate ligament tears	1	-	55% accurate diagnosis
Tuberculosis	7	4	
Septic arthritis	5	2	
Osteoarthritis	2	2	
Rheumatoid arthritis	2	1	
Neoplasms	-	-	
Loose bodies	1	1	
Chondro malacia patella	-	-	

CLINICAL

TABLE 11

Diseases	No.of Cases	Diagnosis (Operative/ Pathological)	Percentage
Meniscal tears	1	1	
Fracture of femoral condyle	1	-	
Cruciate ligament tears	1	1	80% accurate diagnosis
Tuberculosis	7	6	
Septic arthritis	5	5	
Osteoarthritis	2	2	
Rheumatoid arthritis	2	1	
Neoplasms	-	-	
Loose bodies	1	-	
Chrondromalacia patella	-	-	

It must be stressed here that any one parameter in itself does not provide a fool proof diagnosis. The arthroscopic findings, coupled with the clinical picture, radiological and pathological findings, yields a diagnosis rate which will be approximately 90% accurate.

The real test of effectiveness of the arthroscope is demonstrated when it conclusively proves or disproves the need of an arthrotomy. The following observations reveal the

number of cases which continued to arthrotomy following the arthroscopy and also the number of cases in which arthrotomy was actually prevented.

TABLE 12

Diseases	No.of cases proceeding to arthro-tomy	No.of cases in which arthrotomy was prevented	No. influence
Meniscal tears	1	-	-
Fractures of femoral condyle	-	-	1
Fractures of tibial condyle	-	-	-
Cruciate ligament tears	-	1	-
Tears of collateral ligament	-	-	-
Tuberculosis	4	-	3
Septic arthritis	5	-	-
Osteoarthritis	-	-	2
Rheumatoid arthritis	-	-	2
Neoplasma	-	-	-
Loose bodies	1	-	-
Chondro malacia patellae	-	-	-
Total	11 (92%)	1 (3%)	8 (40%)

It has been reported in literature that often arthroscopy has a therapeutic role to play in internal

disorders of the knee joint. How this is brought about is not exactly known. The following is a in observation of the therapeutic value of arthroscopy.

Therapeutic value of arthroscopy

TABLE 13

Diseases	No.of Cases	Therapeutic value	Percentage
Meniscal tears	1	Nil	
Fractures of femoral condyle	1	Nil	
Fractures of tibial condyle	-	-	In 45% of cases there was improvement in the condition following arthroscopy
Cruciate ligament tears	1	Nil	
Tears of collateral ligament	-	-	
Tuberculosis	7	5	
Septic arthritis	5	-	
Osteoarthritis	2	2	
Rheumatoid arthritis	2	2	
Neoplasms	-	-	
Loose bodies	1	Nil	
Chondro malacia patellae	-	-	

Infection Rate

Literature reports a zero rate of infection following arthroscopy. In our series the incidence was very much more significant perhaps due to improper sterilization techniques.

Post-operative complications

TABLE 14

Complications	No. of Cases	Percentage
Pain	14	70.0
Swelling	-	0.0
Infection	2	10.0
Stiffness	-	0.0

DISCUSSION

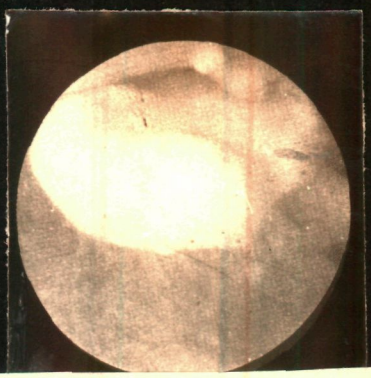
Twenty cases were subjected to arthroscopy due to various internal disorders of the knee. The youngest patient was a 7 year old male child and the oldest a 65 year old man with tuberculosis of the knee.

The left knee was investigated oftener with the arthroscope. The reason for this slight but perceptible difference is unaccountable.

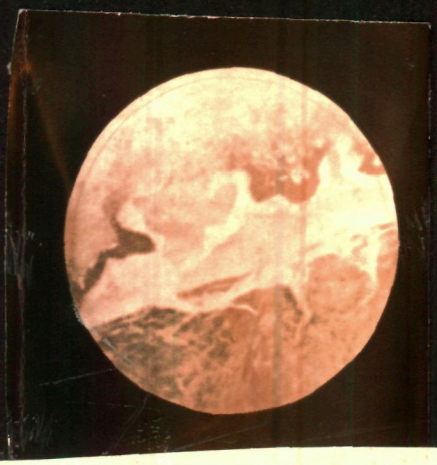
The commonest finding on any arthroscopy was the presence of an inflammed synovial membrane. The consistency and texture of course varied with the disease but there was no mistaking the crimson red colour of the synovium in its inflammed state.

I. Arthroscopy in cases of trauma

Trauma of the knee is all too frequent a complication of modern day life. Be it sports, road side accident or a mere stumble at ones own doorstep - it is the knee joint which bears the brunt of all these insults. However, the physiological response of the knee to trauma is such that it renders it, for a time being atleast, very unsuitable for arthroscopy. The swelling, pain, haemarthrosis all conspire against the arthroscopist and the surgeon is forced to bide his time,



Another Loose Body in the same knee.



SEPTIC ARTHRITIS - The whitish areas represent pus streaks on synovium with strands of tissue.

IV. RHEUMATOID ARTHRITIS :

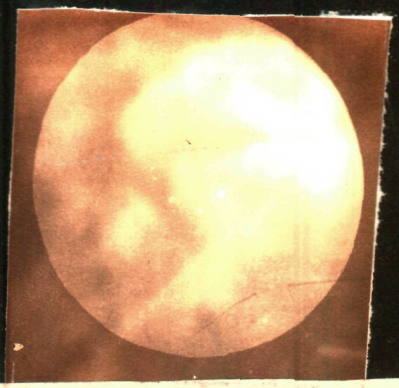
One of our cases was a young woman with proved severe rheumatoid arthritis. The other case was a mild form of the disease in a 45 year old woman.

In the second case there was presence of numerous villi on the synovium and hyperemia was marked. Otherwise the knee joint appeared normal. In the other case, which was more severe and of fairly long duration, changes were more marked. The villi appeared opaque and mass of necrotic tissue was seen floating in the fluid medium. Areas of fibrinous and granulation tissue were observed. At places granulation tissue was to be clearly seen invading the cartilagious areas (Pannus formation).

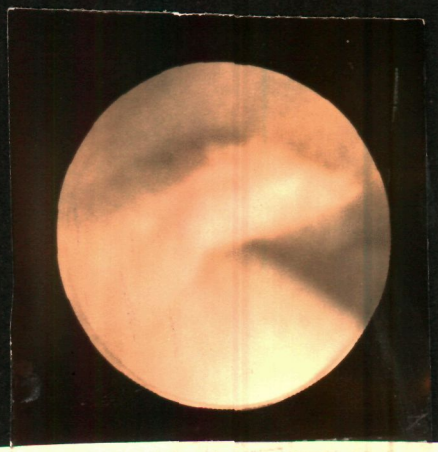
V. LOOSE BODIES :

A man aged 32 came to us with a history of locking of the left knee off and on for the past 6 years. Often he would be symptom free though a sense of insecurity prevailed when he was standing up. The locking occurred in different positions. A tunnel view X-ray clearly showed a loose body in intercondylar area. Before doing arthrotomy arthroscopy was resorted to.

On arthroscopy the loose body was easily identified, about 2 cm in diameter and looked cartilaginous. We could not



RHEUMATOID ARTHRITIS - Photograph shows hypertrophied folds of synovium.



LOOSE BODY - Photograph shows a loose body lying against the curve of the medial condyle.

(b) Septic Arthritis

The number of cases was second only to tuberculosis. Of course clinical methods are more than adequate to diagnose this disease. Arthroscopy however still has a role if a biopsy and pus culture is to be done.

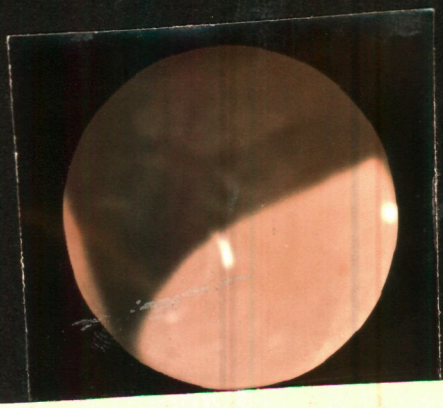
Arthroscopy was done always under continuous irrigation after washing out the joint cavity several times. The synovial membrane appears intensely swollen, reddened and opaque and sporadic necrotic coating and shreds are seen.

Biopsy shows necrosis of synovial lining and a stroma full of polymorphomucleocytes.

III. OSTEOARTHRITIS :

Two cases of osteoarthritis were operated upon. Both had a history of several years duration complaining of pain only. The ages in both the cases was over 55 years. The findings in the two cases were similar on arthroscopy.

The synovial membrane was thickened with marked proliferation of villi. The villi are hypertrophied. The articular surface of the patella shows fibrillation of cartilage. In one case a spur was identified on the anterio-lateral margin of medial condyle of femur.



SEPTIC ARTHRITIS - The articular surface of the femur appears patchy and eroded.

OSTEO ARTHRITIS - The fibrillated cartilage over the condyle of femur is clearly visualized.

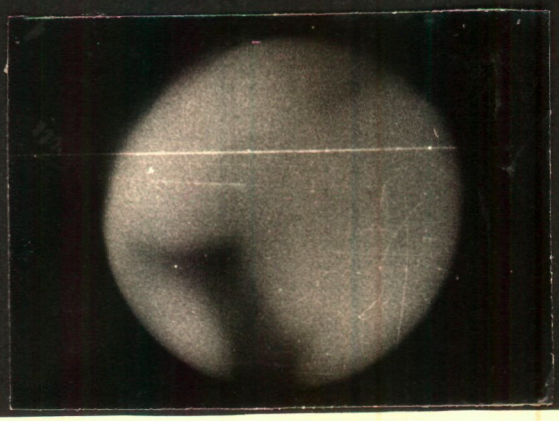
We divided our cases into early intermediate and late stages of the disease.

Synovium: In the very early stage, the internal view is similar to that seen in any kind of mild chronic synovitis, that is reddening of the synovium and presence of a few dilated vessels.

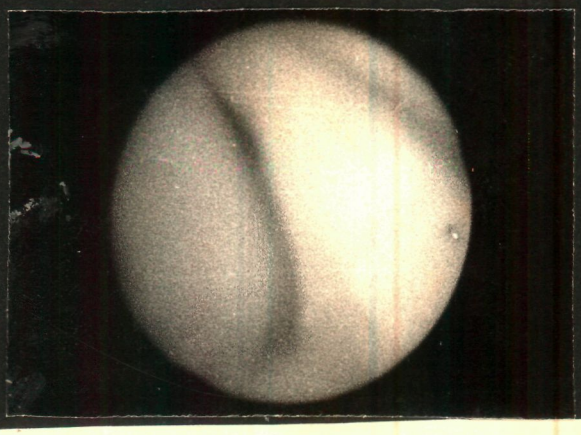
With advancement of the disease there is further reddening of the synovium, with oedema and a few villi formation. These villi become larger and opaque, the synovial membrane gradually changes into granulation tissue with caseous coating and necrotic shreds. The cavity is often filled with blood clots necrotic shreds and granulation tissue. If the infection however is of the suppurative type, the articular surface is obscured by blood clots and necrotic shreds and the underlying granulation tissue is only visible through gaps in the superimposed mass.

Articular cartilage: This appears perfectly normal in the early stages of the disease. Soon, however, it is invaded by pannus or granulation tissue. The erosion of the cartilage can be observed very clearly with the arthroscope.

In all the cases biopsy was done and diagnosis of tuberculosis confirmed.



TUBERCULOUS ARTHRITIS - The synovial folds appear to be heavily hypertrophied.



TUBERCULOUS ARTHRITIS - Folds in synovium.

We waited 3 weeks for the swelling and haemarthrosis to subside. He was subjected to arthroscopy. Though blood was still present to a small extent, the visual field was surprisingly clear. The fracture line was traced from the intercondylar area almost into the supra condylar pouch. Though arthroscopy was not indicated in this case, it provided us with a good surgical exercise.

(c) Cruciate ligament tears

A 25 year old man complained of pain and swelling in the right knee following a fall from a height two months before. He was unable to walk with confidence and the knee was constantly giving way. The anterior drawer sign was positive.

Arthroscopy was done and we were lucky enough to get a clear view of the torn end of the anterior cruciate ligament.

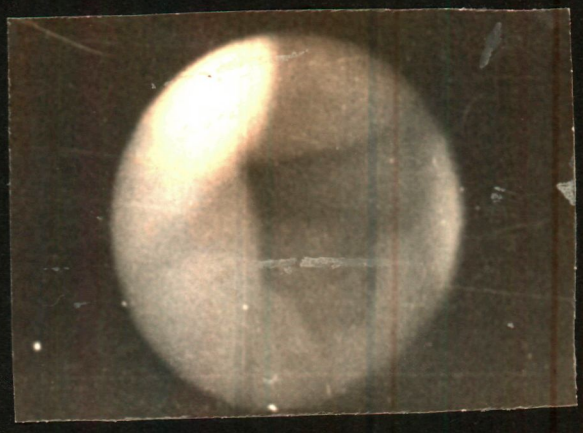
The anterior cruciate ligament is best observed by a lateral infra patellar approach with the knee bent 60-90 degrees.

II. INFECTED CASES

(a) Tuberculosis of the knee joint

This provided us with a never ending stream of varied material. It was here that our arthroscope saw its maximal use.

Torn anterior cruciate ligament - left knee.



RHEUMATOID ARTHRITIS - Photograph shows hypertrophied folds of synovium.

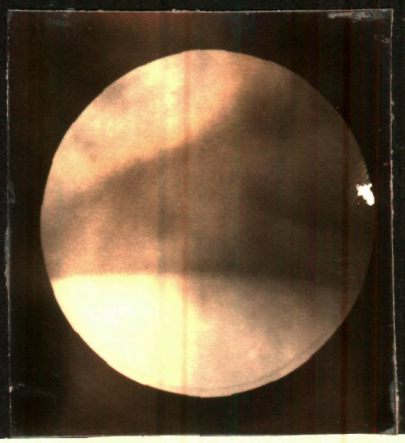
(a) Medial meniscal tears

The middle segment of the medial meniscus is obscured by the rounded femoral condyle but when the tip of the arthroscope is pointed closely to it with the knee in a flexed position with a slight valgus strain, a close up of the inner rim of the middle segment can be obtained. The inner rim here makes a few small undulant folds on the tibial plateau due to normal laxity of the meniscus in the flexed position of the knee. The curvature of the inner rim is concave. If the inner rim is not concave, this becomes a very conclusive finding. In our case the margin was convex. Hence the conclusion was a bucket handle tear of the meniscus. Subsequent arthrotomy proved the arthroscopic finding to be absolutely correct.

As a precautionary procedure the lateral meniscus should be observed also for tears of this meniscus are not uncommon.

(b) Fracture of Femoral Condyle

Our patient was a 55 year old man who had stumbled from a bullock cart and fallen on right knee. X-ray showed a Y shaped fracture which involved the knee joint but not the articular surface of the knee.



Normal medial meniscus of right knee joint.

Torn medial meniscus - Right knee.

waiting for a more opportune moment.

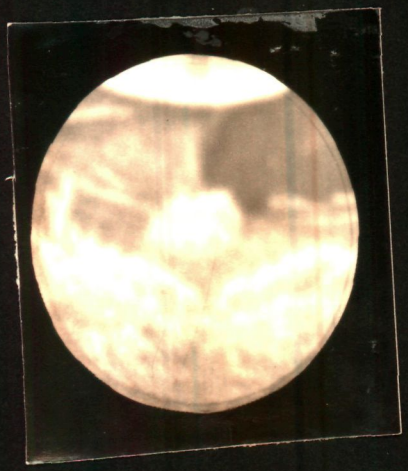
The role of arthroscopy has been clearly defined in trauma and its usefulness demonstrated in two conditions only namely, (a) meniscal tears, (b) tears of the cruciate ligament. Even then these two conditions can be just as confidently diagnosed with careful clinical examination and stress X-ray views.

We ourselves were very reluctant to undertake arthroscopy in an acutely injured knee. Haemarthrosis will make an arthroscopy an exercise in futility, for no matter what amount of irrigation is done, the view through the arthroscope remains marred by a film of red. Besides, introducing the arthroscope into a medium ripe for infection is a practice to be condemned, and in my view wholly unjustified.

Twice we had a chance to undertake arthroscopy in haemophaeliacs. The patient had been given adequate blood transfusions and bleeding time and clotting time were all brought to within normal. We still hesitated with the arthroscope which could very well prove an instrument of menace in these cases. Our decision was possibly right for when later one of the boys underwent an arthrotomy, bleeding proved almost uncontrolable and several days later he was still oozing blood from the knee.

Non-specific synovitis. (from Atlas of Arthroscopy).

Suppurative arthritis (fr Arthritis Atlas of Arthroscopy)



Tuberculous

determine the site from which it had become detached.

Arthrotomy merely confirmed our previous diagnosis and the loose body was removed on arthrotomy.

Indications of Arthroscopy

Different workers in this field have come up with widely differing results and with tall claims as to the usefulness of the arthroscope. However, there is not a shadow of a doubt - that the arthroscope has its place in modern medicine. Let us now examine the indications of arthroscopy in order of its usefulness.

(a) 'Trauma' Cases

(1) Pre-operative confirmation of a meniscal tear in order to obtain more detailed findings and to avoid unnecessary menisectomy.

(2) Ruptures of anterior cruciate ligament.

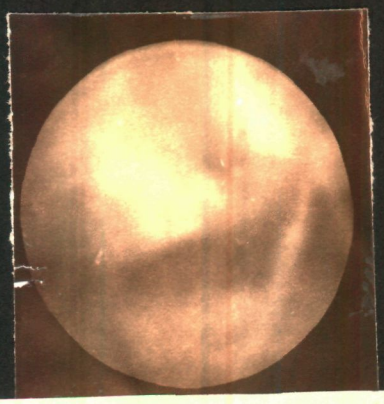
(3) Follow up study of meniscal lesion.

(4) Osteochondral fractures.

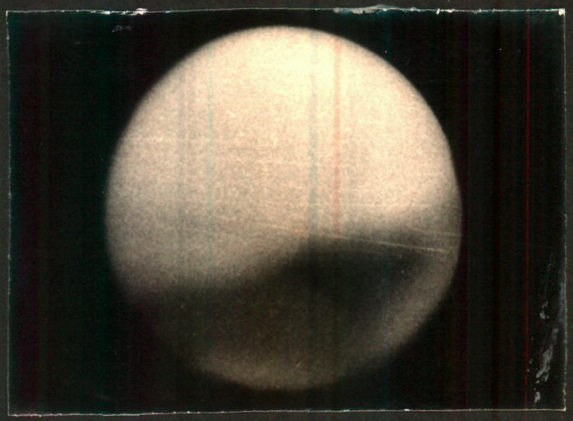
(b) Arthritis

(1) Arthroscopy is an invaluable tool through which accurate biopsies can be taken.

(2) Diagnosis of monoarthritis of the knee.



TUBERCULOUS ARTHRITIS - The articular surface appears covered with fibrinous material.



OSTEO ARTHRITIS - Photograph shows fibrillated cartilage.

DISCUSSION

A few typical views through the Arthroscope.

Non-specific synovitis.(Prominent villi seen.
(from Atlas of Arthroscopy)

Osteo arthritis (from Atlas of Arthroscopy)

Rheumatoid arthritis (from Atlas of Arthroscopy)

Therapeutic aspects

It has been found that washing out of necrotic tissue and debris is a very useful method of treating rheumatoid arthritis and osteoarthritis.

Infection Rate

We had a significant infection rate - 2 cases out of 20. However, one case of septic arthritis had been conservatively treated on antibiotics and it is possible that the trauma of arthroscopy re-activated a focus.

The others case was that of tuberculosis in which secondary infection set in following arthroscopy and arthrotomy.

Other Post-operative Complications

These as such were minimal and were confined to a mild ache which lasted less than a day. Patients were treated on analgesics and discharged the next day with instruction to freely use that limb.

Assessment of Arthroscopy as a Diagnostic Tool:

Different workers sing different tunes as to the effectiveness of the arthroscope in its role of a diagnostic instrument. Kenneth B. De Haven and Roger Collins (M.D.) claim an accuracy rate of over 94%. Our own analysis is very

much more modest ranging between 65 to 70%. The above workers further claim that in a series of 23 patients, unnecessary operation was avoided in 21 - a very impressive figure indeed. Of course, these workers have had years of experience with hundreds of patients to their credit - an achievement we could not hope to match.

Another worker, Cascells, suggests that accurate diagnosis can be made with the arthroscope only in 70-80% of cases - a figure near our own findings.

Our impression of the arthroscope is that it can never replace clinical judgement or the radiologist. It merely supplements the findings and aids to confirm what we clinically or radiologically already suspect.

Arthroscopy can be used as a surgical exercise in all derangements of the knee even when the diagnosis is certain. But it has proved to be singularly useful in the following conditions.

1. Meniscal tears (pre-operative).
2. Follow up of patients who have had prior surgery (patellectomy, menisectomy etc).
3. Accurate punch biopsy for localised lesions in the knee.

C O N C L U S I O N

CONCLUSION

Several factors influence the accuracy of diagnosis using the arthroscope. These factors are:-

1. The experience of the arthroscopist and the expertise he has thus acquired. The accuracy of diagnosis is in direct proportion to the number of arthroscopies done by the surgeon concerned.

2. The pathology which inflicts the knee joint.- An accuracy rate of 94% has been reported in literature with meniscal tears. Our success with the arthroscope was limited to 70-75% accuracy in general.

3. The site of pathology.- Lesions in the periphery of menisci and the posterior compartment of the knee are difficult to diagnose.

In most cases the clinical impression and the radiological findings are sufficient to reach an accurate diagnosis. Resorting to arthroscopy in such cases is wholly unjustified and should be done only when a biopsy is needed. As such indications of arthroscopy are few. These are:-

1. Meniscal tears - a pre-operative assessment.
2. Follow up of patients who have had prior surgery (patallectomy, menisectomy etc.).

3. Diseases in which the clinical and radiological diagnosis is equivocal and which needs an accurate biopsy under direct vision through the arthroscope.

Complications of arthroscopy

Complications were practically non-existent. The two complications we did encounter were:-

1. Pain - In 70% of cases there was pain post-operatively but this was mild enough to be controlled with analgesics.

2. Infection - We reported an infection rate of 10 per-cent which at first glance appears rather high. But infection occurred in one case of stiff knee following previous septic arthritis. The arthroscopy perhaps inflamed an already existing focus of infection. In another case arthrotomy was done following arthroscopy and this operative interference was probably responsible for the infection. In both cases the infection was easily controlled with antibiotics.

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